



CONSERVATION OF AFRICAN MANATEE (*Trichechus senegalensis*) THROUGH TRADITIONAL ECOLOGICAL KNOWLEDGE IN PANDAM WILDLIFE PARK, PLATEAU STATE, NIGERIA

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ABSTRACT: The study on the distribution, abundance and habitat use of the West African manatee in Pandam Lake through Traditional Ecological Knowledge (TEK) was conducted between 2010 and 2012. Rapid Rural Appraisal (RRA) approach (questionnaire and focus group discussion) was adopted. One hundred and twenty (120) questionnaires were distributed to all the fishermen in Pandam, Aningo and Sabongida villages in the study area with eight groups created from the fishermen. Descriptive analysis was used for data collected while data on years of fishing experience were correlated with data on abundance. Age of the respondents ranged from 21 to 80 years with 10-60 years of fishing experience. All the respondents had sighted manatee in manatee stream (MS), GU and Zuzurfar arm (ZU) but 54.17% did not sight manatee in the main Lake (ML). Also 63.33% (n=76) usually sight manatee >4 times/month in the dry season while 0.83% (n=1) usually sight manatee >4 times/month in the wet season. 63% (n=75) of the respondents sight manatee mostly in the evening (18-21hr), 27% (n=33) sight manatee mostly in the early hours (5-11hr). Sighting of 2-3 manatees together is more common 56.67% (n=68) of the respondents, 33.33% (n=40) mostly sight 1 manatee while 10% (n=12) mostly sight 4-6 manatees together but none of them sighted >6 manatees together. Manatee presence indices include: Grazed bank vegetation, Torn net, Trails or cloud of mud, Dung, oil extract and bone from dead manatee. Manatee was said to be feeding on *Echinochloa stagnina*, *Echinochloa pyramidalis*, *Polygonum lanigerium*, and *Nymphaea lotus*. This study has clearly shown that TEK can be used as an important instrument to collect baseline information that will enhance the field ecological study and that effective conservation strategy can be achieved by integrating local communities' knowledge in conservation programs especially when dealing with species that are difficult to study like manatee. For this reason, recommendation related to manatee conservation or a management plan, should not only rely on ecological field result but, take into consideration the perception and recommendations from the local population regarding manatee.

Key words: Local Knowledge, African manatee, Population, conservation

1. INTRODUCTION

The West African manatees (*Trichechus senegalensis*) belong to the order Sirenian, an ancient and diverse group

of aquatic mammals dating back over 50 million years. There are four extant species in two families remaining today. The four extant sirenians are large herbivorous and totally aquatic mammals that fill a unique ecological

niche in tropical lakes, rivers and coastal regions around the world (Reeves *et al.* 1988). Unfortunately, all four sirenian species are endangered despite their protected status under local and international laws. *Trichechus senegalensis* is the least studied sirenian species and Red listed as “Vulnerable” by the IUCN Species Survival Commission, Sirenian Specialist Group (Powell and Akoi 2006).

Manatees tend to aggregate in a clumped distribution pattern in preferred habitats with little or no disturbances or areas that best meet their biotic and abiotic requirements. However, (Nomura and Higashi, 2000) stated that due to patchy distribution of food resources and variation in habitat characteristics, there is unequal distribution of the species and various habitat usages which can be revealed by assessing the sighting frequency at different sites. Powell (1996), said that in riverine habitats that have major fluctuations in flow rates and water levels, manatees seem to prefer those areas that have access to deep pools or connecting lakes for refuge during the dry season and seasonally flood into swamp or forest with abundant grass and sedges, particularly *Vossia*, *Echinochloa* and *Phragmites*. Manatees are primarily herbivores. They feed on a wide variety of emergent, floating, shoreline, rather than submerged vegetation except in coastal zone where they eat sea grass (Rathburn 1990; Iwar 2003; Daniel and Abdul 2006). In Nigeria, manatees feed on *Ipomea aquatica*, *Polygonium lanigerum*, *Eichonia crassipes*, *Cardiaspermum hadcocabum*, *Striga hermontheia*, *Cynodon dactylon*, *Digitaria horizontalis*, *Vitevenia flavibarbis* and *Vossia cuspidata* (Iwar 2003). In Sierra Leone, *T. senegalensis* is considered a pest because they consume fields of planted rice (Daniel and Abdul 2006). In Cameroon, they feed on fish and oysters in fishing nets (pers. Comm). In Ghana, manatees have been reported to consume *Echinochloa pyramidalis*, *Echinochloa stagnina*, *Lemna spp.*, *Nymphaea lotus*, *Polygonium spp.*, and *Vossia cuspidata* (Ofori-Danson 2009).

Many manatees in Florida are accidentally killed due to collision with watercraft, entanglement in fishing gear or crushing and drowning in canal locks or flood control structures (Barbara and Jeff, 1998). In West Africa, the decline of the manatee population is largely attributable to hunting and incidental capture in fishing nets. Powell (1996) estimated that around two manatees per year were taken between 1978 and 1983 from Gambia River, Western scientists have typically rejected the traditional knowledge of indigenous peoples, particularly in Africa, as anecdotal, non-quantitative, and unscientific (Sommer 2004). Today, however, conservation researchers are approaching Traditional Ecological Knowledge (TEK) with increased alacrity, recognizing its potential contributions to both the understanding of biological

phenomena and the practice of protecting species and ecosystems (Shackeroff 2007). Conservation strategy can be based on traditional knowledge and resource use (Redford and Padoch 1992; Redford and Mansour 1996 cited in ICSU 2002). African governments and international development agencies are also recognizing that local-level knowledge and organizations provide the foundation for participatory approaches to development (Warren 1992). By encompassing the skills - that is, experiences and insights of people - applied to maintain or improve their livelihood, TEK proves to be important in a variety of research and applied fields of conservation. TEK provides the basis for local-level decision-making about many fundamental aspects of day-to-day life of hunting and fishing (ICSU 2002) that plays a significant role in the development of hypotheses, research designs, methods and interpretations employed by scientists. Conservation strategy can be based on traditional knowledge and resource use (Redford and Mansour 1996 cited in ICSU 2002). An outstanding role of TEK is the possibility of allowing conservationists to integrate their programs with real human needs and practices. Conservation by exclusion and isolation will not be sustained in the face of growing poverty (ICSU 2002); for this reason, recommendation related to manatee conservation or a management plan, not only rely on ecological field result but, also took into consideration the perception and recommendations from the local population regarding manatee. The objective of this study therefore is to use local peoples’ knowledge to collect ecological data (distribution, abundance, sighting frequency, food resources) and human- manatee related conflict in Pandam Lake.

2. METHODOLOGY

2.1 Study Area

The study was carried out in Pandam Wildlife Park, Plateaus State located in the middle belt region of Nigeria (Figure 1). It lies between Latitude 8°35'N and longitude 8°55'N and latitude 8°00'E and longitude 10°00'E. It covers an area of 224km² and is located 58km along the Lafia-shendam road to the north of Benue River (Ezealor 2002) and South of Plateau state (Akosim 1997) in Quanpan local government area. It is bounded on the East by Namu and Kuagarda, on the west and north by Dep River and in the South by Aningo and Pandam communities (Akosim 1997). The entire area is drained by Dep and Li Rivers and joins to make a Y-shape before emptying into Benue River. The land slopes gradually south wards and form a basin – “Pandam lake” – wetland complex of approximately 22km. The entire park lies within the guinea savannah eco-zone. Thus the vegetation of the park is typical Sudan-Guinea savannah with gallery forest in riparian areas. Pandam Wildlife

Park is managed by the Plateau State Tourism Corporation. The wet season lasts from April to October and annual rainfall is 1,000–1,500 mm.

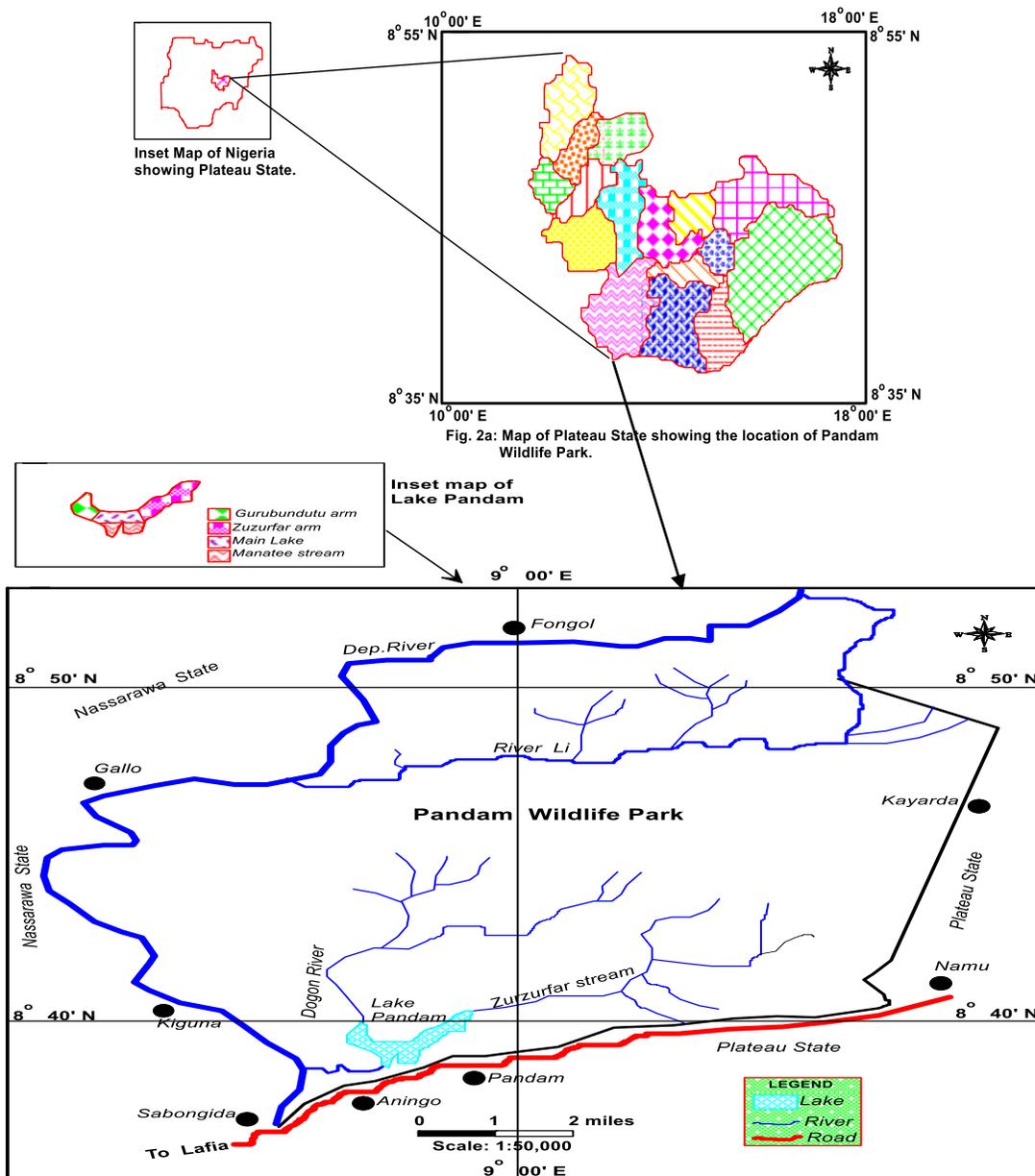


Figure 1: Sketch map of Pandam Wildlife Park showing Pandam Lake

2.2 Methods

Rapid Rural Appraisal (RRA) (Cavestro 2003) approach using two methods: questionnaire survey and the focus group discussion (Aristide 2011 and Piran et al. 2005)

was adopted for this study. A total of one hundred and twenty (120) questionnaires were distributed to all the fishermen in Pandam (35), Aningo (20) and Sabongida (65) villages in the study area, to investigate the local peoples understanding of the ecology of *T. senegalensis*

in the study area. The respondents were chosen according to their experience in working aquatic milieu, so fishermen with more than 5 years of fishing experience were targeted. The interview was conducted in English; however, there was always a local field assistant and guide to help with translation in case the respondents do not understand English.

The questionnaire had three sections. The first section seeks to get the profile of the fishermen (age, marital status, years of experience, level of education). The second section focused on the ecology (distribution, abundance, food resources, frequency and time of sighting of manatees in relation to seasons and locations). The last section identified fishermen-manatee related conflicts (tearing of fishing nets and eating of fish in the net) and conservation awareness on manatee. Picture of manatee was then shown to respondents for confirmation.

Eight groups comprising of members between 10 and 12 were created from the fishermen group in the three villages to discuss issues relating to manatee ecology. Questions were asked in the simplest format using familiar terms and the translation in local language was done. Questions focused on four aspects related to manatees: (1) the various signs, whether direct or indirect, that enable them to recognize manatee presence as well as the number and frequency of sighting manatee; (2) the areas, time and season when those signs are most abundant; (3) food and feeding habit of manatee; (4) human-manatee conflicts and their awareness about manatee conservation. Each meeting lasted 1 to 2 hours.

2.3 Statistical Analysis

Data obtained from questionnaire were stored in Microsoft Excel (version 16) spreadsheets and cross-tabulated into contingency tables and described using graphs, bar and pie charts, tables, percentages and frequencies. Data on years of fishing experience of respondents were correlated with results on number of manatees mostly sighted, period of the day when manatees were mostly sighted and the frequency of manatee sighting in the dry and wet seasons to determine the level of association.

3. RESULTS

The age of respondents ranged from 21 to 80 years, with a mean age of 43.12 ± 1.24 . The result showed that the fishermen in Pandam village had the highest mean years of experience of 33.63 yrs followed by fishermen in Sabongida with 29.88 yrs while fishermen in Aningo had the lowest mean years of experience of 16.45 yrs (Figure 2). Majority of the fishermen (85%) in the three villages

carry out their fishing activities all year round while 15% only fish during the dry season.

3.1 Distribution of manatee in Pandam Lake

In summary, 35% (n=42) of the respondents sighted manatee in MS alone, 25% (n=31) sighted manatee in MS, GU, ZU alone, 11.67% (n=14) sighted manatee in ML, GU, ZU alone, 8.33% (n=10) sighted manatee in MS, ZU alone, 7.5% (n=9) sighted manatee in GU, ZU alone, 5.83% (n=7) sighted manatee in MS, GU alone, 3.33% (n=4) sighted manatee in ML, MS, ZU, GU, 1.67% (n=2) sighted manatee in GU alone while 0.83% (n=1) sighted manatee in ZU alone (figure 3).

3.2 Frequency of sighting manatee by the respondents

The result of the frequency of manatee sighting according to the respondents revealed that 63.33% (n=76) sighted manatee >4 times/month in the dry season while 0.83% (n=1) sighted manatee >4 times/month in the wet season. Also 30% (n=36) sighted manatee 3-4 times/month in the dry season with 15.83% (n=19) sighting manatee 3-4 times/month in the wet season while 6.67% (n=8) and 83.33% (n=100) of the respondent sighted manatee 1-2 times/month in the dry and wet seasons respectively (Figure 4).

The result of the time of the day when manatees are mostly sighted (figure 5) showed that 63% (n=75) of the respondents sighted manatee mostly in the evening (18-21hr), 27% (n=33) sighted manatee mostly in the early hours (5-11hr), 9% (n=11) sighted manatee mostly in the late afternoon (14-18hr) while 1% (n=1) sighted manatee mostly in the early afternoon (11-14hr).

3.3 Number of manatee mostly sighted by the respondents

In total, 56.67% (n=68) of the respondents mostly sight 2-3 manatees together, 33.33% (n=40) mostly sight 1 manatee while 10% (n=12) mostly sight 4-6 manatees together but none of them sighted >6 manatees together (figure 6). The result also showed that 12 (42.86%), 13 (65%), and 43 (69.23%) of the respondents in Pandam, Aningo and Sabongida villages respectively sighted 2-3 manatees together, 18 (51.43%), 5 (25%) and 17 (26.15%) of the respondents in Pandam, Aningo and Sabongida villages mostly sighted one manatee while 5 (14.28%), 2 (10%) and 5 (7.70%) of the respondents in Pandam, Aningo and Sabongida villages respectively sighted 4-6 manatees together (figure 7). Moreover, all the respondents have seen manatee either feeding, moving or stationary at one time or the other. The respondents further said that they mostly sight one

manatee in the rainy season with groups mostly sighted in the dry season.

3.4 Plant species consumed by manatee in Pandam Lake

All the respondents said that manatee feed on variety of grasses like; *Echinochloa stagnina*, *Echinochloa pyramidalis*, *Polygonum lanigerium*, and *Nymphaea lotus* but the most preferred plant consumed is *Echinochloa stagnina* in the rainy season and *Nymphaea lotus* in the dry season. This they said is easily differentiated by the colour of the dung.

3.5 Threats, mortality and conflict

All the respondents 100% (n=120) have not seen a dead manatee in Pandam Lake in the past 5-10 years. They also said that their fishing net has never retained manatee. However, 34% (n=41) of the respondent said that manatee has torn their fishing net 11-15 times within the last ten months (January- October, 2012), 29% (n=35) of them said that their net has been torn 16- 20 times, 20% (n=24) have their net torn 6-10 times, while 14% (n=17) and 3% (n=3) of the respondent have their net torn >20 times and 1- 5 times respectively (Figure 8). All the respondents said that the population of manatee is increasing because there is reduction in hunting pressure, and that the habitat is conducive for reproduction. Furthermore, all the respondents did not foresee any threat to the conservation of manatee in Pandam Lake.

3.6 Focus group discussion summary data

After discussion during the focus group, the following information on Manatee presence indicators/indices was obtained and summarized below to include: Grazed bank vegetation (grass) at the level of the leaves or the stalk that can be observed both in the rainy and dry seasons by fishermen; Torn net (Wide piecing hole on fishing nets with mud from the body of manatee); Water bubbles produced when manatee is breathing close to the water surface; Trails or cloud of mud that form just after the manatees passes by. This occurs mostly in dry season at any time of the day; Dung green/ black in color and cylindrical in shape is commonly sighted by the fishermen both during the dry and rainy season, mostly observed in the morning; They sometime show their back (with the skin similar to the elephant) out of the water surface, mostly observed during the dry season. This was also stated by the Fisheries officer of Pandam Wildlife Park. Concerning threats from manatee to human, the fishermen agreed on the fact that manatees always destroy a large number of nets but they have not seen any manatee feeding on their catches (fish).

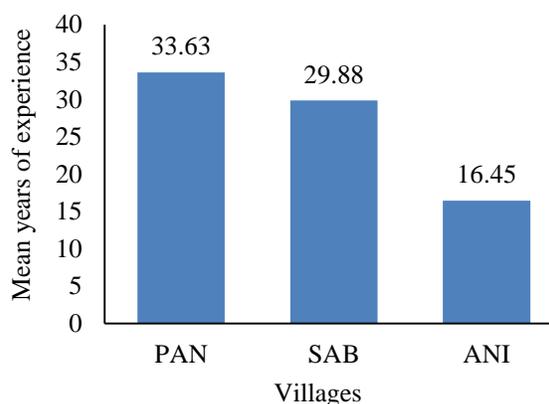


Figure 2: Mean years of experience of fishermen in the three villages

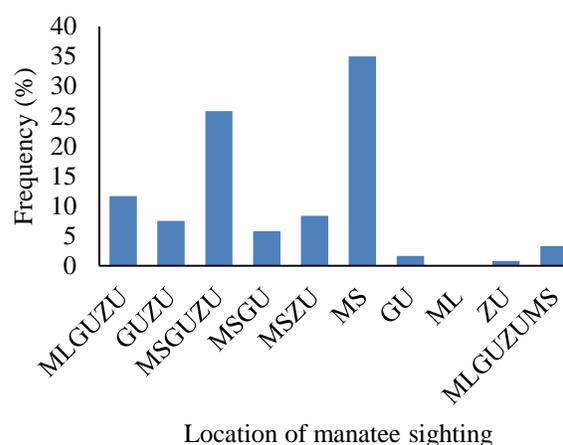


Figure 3: Distribution of manatee in Pandam Lake.

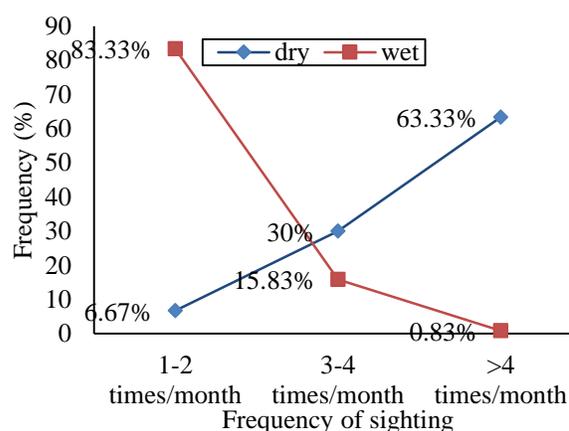


Figure 4: Frequency of sighting manatee in the dry and wet seasons in Pandam Lake.

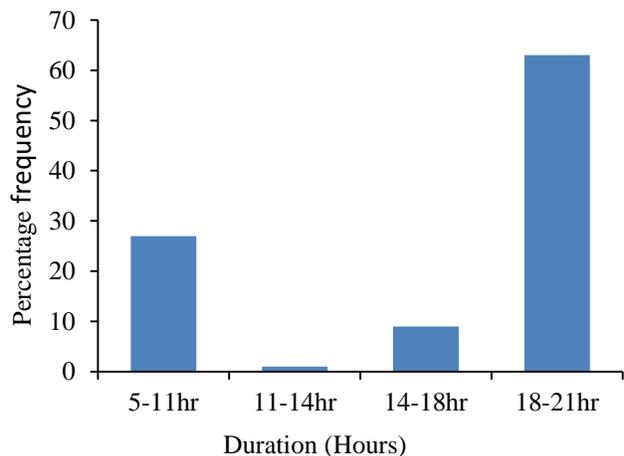


Figure 5: Percentage frequency of the period of the day when manatees are mostly sighted in Pandam Lake.

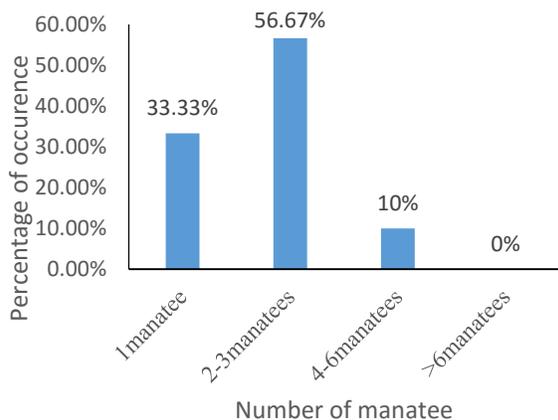


Figure 6: Summary of the number of manatee sighted by all the fishermen in Pandam Lake

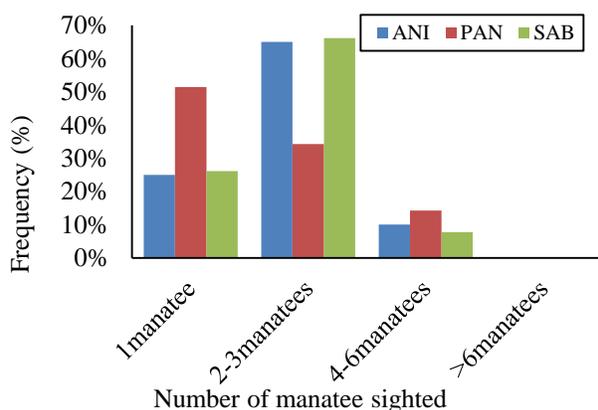


Figure 7: Number of manatee normally sighted by fishermen of Aningo, Pandam and Sabongida villages in Pandam Lake

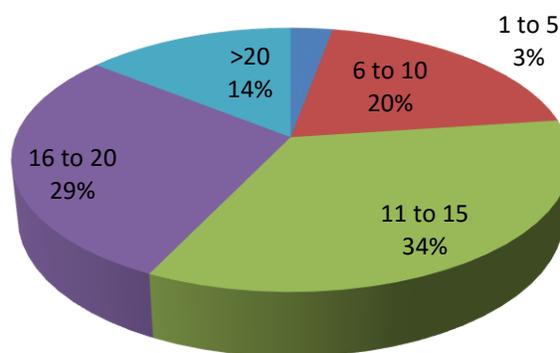


Figure 8: Number of fishing nets torn by manatee in Pandam Lake

4. DISCUSSION

Based on the information gathered from the experienced fishermen in the three villages, manatees were still present in Pandam Lake. This was further proven by the description of the animal by the respondents as well as the presentation of the oil extracted from a manatee and the dung (fecal dropping) collected while fishing. The respondents also stated that they have seen manatee at one time or the other in the three arms of the Lake as well as the main Lake. This is in agreement with the statements of Shykes (1974 cited in Powell 1996), Osakwe and Meduna (1988) and Powell (1996) who reported the presence of manatee in the Lake. The frequency of sighting manatee is higher in the dry season than the rainy season. This according to them was due to the increase in water volume in the rainy season which made the manatee to spread in search of food and that the water current and volume were high in the rainy season. This may also be due to the fact that during the rainy season, water current may be high in some areas and low in others, thereby affecting food availability. This suggests that manatees make regular movements during the wet season, when the water level increases in search of food. The numbers of manatees sighted by the respondents also varied but sighting of 2-3 manatees were more common than individual manatee. For instance, 56.67% of the respondents sighted 2-3 manatees at once while 33.33% and 10% of the respondents' sight one manatee and 4-6 manatees respectively. However, during focus group discussion the respondents were divided in their view as some of them were of the opinion that group of manatees was more common than only one while others believed that sighting of one manatee was more common than group of manatees. The first view was in support of the findings of Aristide (2011) who reported that manatees in Cameroon were more frequently observed in groups of 2 or 3 individuals than they were observed alone or in groups of more than three. The second view expressed

during focus group discussion was in line with the findings of Akoi (2004) who observed that of the 17 radio tagged individuals in Cote d'Ivoire that manatees are often alone. He further stated that manatees seemed to congregate in certain locations in groups of 25-30 during the rainy season which correspond to their breeding season. According to the fishermen, manatees were sighted more at night (18.00-21.00hr) and in the early morning (5.00-11.00hr). This was evidenced by 62.5% and 27.5% of the respondents who reported sighting manatees most commonly between 18.00-21.00hr and 5.00-11.00hr respectively. Reported sightings at midday and in the afternoon were rare which might be due to the fact that, at this time, manatees might be resting under water agitated by the waves or the wind. So, with reduced movement of the animals their visibility or detection might be very difficult. However, it is important to note that most fishermen were off the water during midday and afternoon to take a rest; therefore, one cannot assume that manatees were not frequent at this period of the day. Observations of tagged and radio-tracked manatees in Cote d'Ivoire (Akoi, 2004), suggested that manatees generally feed from 18.00-22.00 hours, and from 02:00-05:00 hours, but rest generally from 11:00-15:00 hours. This observation was similar to the information provided by fishermen in the three villages around Pandam Lake.

In the course of this study the following plant species were reported by fishermen as manatee food sources: *Echinocloa stagnina*, *Echinocloa pyramidalis*, *Polygonum lanigerium*, and *Nymphaea lotus*. All these plant species were previously known from the *T. senegalensis* food species list provided by Powell (1996) and Ofori- Danson (2009).

Though all the respondents said that they had not seen any dead manatee in the last 5-10 years, neither had their nets retained any manatee, but the fishing activities of the fishermen could be a threat to manatee as they were involved in fishing twice daily (morning and evening) all year round using different fishing gears. The hunting pressure on manatee in Pandam Lake is low as only 0.83% (n=1) of the respondent showed evidence (oil extract and harpoon) of hunting manatee and had killed a manatee in the last one year. This low hunting pressure could be attributed to the fact that Pandam Lake is in a protected area where there is a law banning the killing of the animal. This, also according to them was responsible for the increase in the population of manatee in the Lake. However, this statement may not be totally true because during the questionnaire administration some of the respondents felt reluctant somehow when answering the questions posed to them, thinking that the researcher was all out to implicate them. All the respondents reported that manatee cause them some economic loss as a result

of the tearing of their fishing nets. This observation was also reported by Aristide (2011).

5. CONCLUSION

This study has clearly shown that:

1. TEK can be used as an important instrument to collect baseline information that will enhance the ecological study in the field.
2. Effective conservation strategy can be achieved by integrating local communities' knowledge in conservation programs especially when dealing with species that are difficult to study like manatee.
3. Recommendation related to manatee conservation or a management plan, should not only rely on ecological field result but, take into consideration the perception and recommendations from the local population regarding manatee.

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